December 2, 2014
(Last update: 12/10/14)

Handouts of the Graduate Faculty Council

Michigan Tech
Graduate Faculty Status Review Template

Version 2.1

This template is meant to assist unit chairs/deans with the periodic review of the qualifications of each of their graduate faculty-eligible members as per Section 1.5.3 “Graduate Faculty Status” of the Faculty Handbook. Completed forms will be reviewed by the Dean of the Graduate School and will be used to update the listing of eligible Graduate Faculty.

This review shall take place every 6 years from the start of the member’s eligible status as graduate faculty. To retain the status of Graduate Faculty, the unit chair/dean must circle at least one item in Section 1 and one item in Section 2 related to the faculty member under review.

1. Qualifications of Graduate Faculty. Does the faculty member under review meet one or more of the following criteria? (Circle all that apply.)

   a. Possesses experience and continued interest in the conduct of research.

   b. Has the necessary background for, and a continued interest in, teaching graduate courses.

   c. Has continuing interest in serving as a graduate student advisor.

2. Evidence of Qualifications. Does the faculty member under review meet one or more of the following criteria? (Circle all that apply.)

   a. Is currently involved in research work or graduate instruction or in advising graduate students.

   b. Regularly publishes articles in recognized journals having national distribution or books related to their field of study.

   c. Has earned the terminal degree in his/her field.

Response by reviewee:

Faculty members should indicate in writing below whether or not they concur with the unit chair’s/dean’s review. If the faculty member does not concur, the member should support their argument with reasons, providing relevant evidence.
1.5.3 Graduate Faculty Status

A. Membership

The Graduate Faculty consists of tenured and tenure-track members of the academic faculty holding the rank of ASSISTANT PROFESSOR, ASSOCIATE PROFESSOR, or PROFESSOR who have been appointed by the Dean of the Graduate School. Tenured and tenure-track faculty who are awarded EMERITUS status upon retirement remain members of the Graduate Faculty.

The Dean of the Graduate School may also grant graduate faculty status to others with an on-going professional relationship with Michigan Tech, including RESEARCH, PART-TIME, VISITING, or ADJUNCT faculty members, LECTURERS and INSTRUCTORS, RESEARCH ENGINEERS, and RESEARCH SCIENTISTS.

Under special circumstances, the graduate dean may appoint individuals with special technical expertise to the Graduate Faculty for a specific term and purpose, such as serving as a member of a student's advisory committee.

Graduate faculty members are eligible to teach graduate courses (5000 level and above), serve as examining members on Masters and PhD committees, and supervise Masters and PhD students.

Persons who are not members of the Graduate Faculty may teach 5000 and 6000 level courses only after obtaining written approval from the Dean of the Graduate School.

B. Qualifications of Graduate Faculty

1. Qualifications expected for graduate faculty appointment:

   a. Experience and continued interest in the conduct of research.
   b. The necessary background for, and a continued interest in, teaching graduate courses.
   c. Continued interest in serving as a graduate student advisor.

2. Evidence of Qualifications
Faculty may meet the qualification requirements if they:

a. Are currently involved in research work or graduate instruction or in advising graduate students.

b. Regularly publish articles in recognized journals having national distribution or books related to their field of study.

c. Have earned the terminal degree in their field.

C. Appointment Procedures

Graduate Faculty appointment and retention decisions are made by the Dean of the Graduate School with recommendations and advice from department chairs, deans of colleges and schools, and the Graduate Faculty Council.

Recommendation for Graduate Faculty status is made in writing by the department chair of the appropriate academic unit or by the dean of the appropriate School. These recommendations are forwarded to the college dean, where appropriate, and then to the Graduate Dean.

D. Review of Graduate Faculty

It is expected that department chairs/school deans will continually review the performance of all individuals holding graduate faculty status in their respective units using criteria outlined in Section B above.

When, in a department chair/school dean's professional judgement, a faculty member holding a graduate faculty appointment is no longer satisfactorily functioning in this capacity, s/he must recommend that the individual in question be removed from graduate faculty status. The Dean of the Graduate School may also initiate the removal process in consultation with the appropriate chair/dean. The Dean of the Graduate School will act on recommendations with the advice and consent of the Graduate Faculty Council.
Senate Proposal

Proposed by the Jackie Huntoon on behalf of Graduate Faculty Council

November 2014

Background
The Graduate Faculty Council consists of representatives of each graduate program at Michigan Tech, including non-departmental programs. This council received a number of comments regarding the deadlines associated with completing graduate degrees. The deadlines are related to ensuring that the final dissertation, thesis or report conforms to the guidelines established for these documents at Michigan Tech. These comments came from both faculty and students. There were two key themes to these comments:

1) Fairness – that all graduate students should be treated the same and that any ambiguity in the wording of deadlines (such as major vs. minor changes) be eliminated
2) Expectations of graduate students - that the expectations of graduate students be met as they go through this process. Many graduate students find that their graduation is deferred for a semester due to the continued need for changes to their since thesis, dissertation or report.

The process
An ad hoc committee was formed to address these issues, and the committee brought forward recommendations for changes to the deadlines to the full council. The full council then extensively discussed and adjusted those proposed changes.

Proposal
It is proposed to adopt the deadlines for dissertation, thesis, and report submission as shown in Table 1. The deadlines would be enacted no earlier than spring 2015, pending Senate approval in time for spring adoption.

Table 1 includes the actual dates that would have applied if the new deadlines were in place for the Fall semester of 2014. The dates chosen for milestones I and II were selected to give students the maximum amount of time to complete their degree in the desired semester. The deadlines for milestones III and IV provide time for the student to address any irregularities in their final document that are found during review by the graduate school.
Table 1. Deadlines approved by Graduate Faculty Council Deadlines for Dissertation, Thesis, and Report Submission

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Deadline (approved by GFC)</th>
<th>Deadline (current)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Last day to <strong>schedule a final oral examination</strong> (submit Pre-defense form and draft of dissertation, thesis, or report to Graduate School)(^a)</td>
<td>Tuesday, Week 10 November 10, 2014</td>
<td>Two weeks before final oral examination</td>
</tr>
<tr>
<td>II. Last day to <strong>hold a final oral examination</strong></td>
<td>Tuesday, Week 12 November 18, 2014</td>
<td>-NA-</td>
</tr>
<tr>
<td>III. Last day to <strong>submit advisor and committee approved dissertation, thesis, or report and all associated degree-completion paperwork to the Graduate School</strong>(^a,b,c,d)</td>
<td>Monday, Week 13 December 1, 2014</td>
<td>Monday, Finals week December 15, 2014</td>
</tr>
<tr>
<td>IV. Last day for <strong>Graduate School to return a review of the dissertation, thesis, or report</strong> and forms to student (if preceding deadlines were met by the student)(^d)</td>
<td>Monday, Finals week December 15, 2014</td>
<td>Monday, two weeks after finals week December 29, 2014</td>
</tr>
<tr>
<td>V. Deadline to <strong>turn in the final, fully corrected dissertation, thesis, or report</strong> that conforms to all requirements specified by the Graduate School in its review(^e)</td>
<td>Friday, Finals week December 19, 2014</td>
<td>Friday, Finals week December 19, 2014</td>
</tr>
</tbody>
</table>

a. If a student does not meet the deadlines for Milestones I, II and III, they will not be eligible to graduate during the current semester. Students who fall into this category will have to pay regular tuition and maintain continuous enrollment per Graduate School policies until they complete their degree.

b. If a student meets the deadlines for Milestones I, II and III, they may opt out of paying tuition in the following semester, even if they are unable to turn in a final, fully corrected document that conforms to all Graduate School requirements before the end of the current semester. Instead, these students will be eligible to pay the dissertation/thesis/report completion fee and complete their degree in the subsequent semester.

c. If a student does not meet the deadline for Milestone III, they will need to register for a minimum of one credit in the following semester because they require the input of faculty subsequent to the deadline date for Milestone III. International students must ensure that they comply with minimum registration requirements specified by the US federal government.

d. Documents received after the deadline date for Milestone III will be reviewed in the order received and returned within two weeks after the date of submission.

e. If the deadlines for all other Milestones have been met, but the “final” document that is submitted is:
  • not fully corrected so that it conforms to all Graduate School requirements, or
  • not submitted by the deadline date for Milestone V, the student will be allowed to opt out of paying tuition for the subsequent semester and will be allowed to instead pay the dissertation/thesis/report completion fee. The student will then be eligible to complete their degree in the subsequent semester.
Prerequisites for graduate students

Background information:
- Prerequisites have not been checked for graduate students for several years
- Prerequisites are included in the course description (in the catalog and online) as background information only; students are expected to police themselves and make sure they are prepared for a course, but that often is not the case
- Academic misconduct cases have increased recently for graduate students, often because students do not have the prerequisite knowledge to be successful in a course
- In the last few years, two different programs (MBA and MEEM) have asked to have the prereqs checked for their students
  - Students in these programs are checked for prerequisites for all of their courses, even undergraduate level courses
  - Students in other majors can take a MEEM course without being checked for prerequisites

Additional Information:
- Prerequisites are checked based on student level, not course level
- Departments may also restrict registration in a course by
  - Including or excluding by
    - Major
    - College
    - Student level
  - Requiring
    - Instructor approval
    - Department approval
- When prerequisite checking is turned on, the process checks the prereqs on all courses the student registers for, even if it’s an undergraduate course
- Graduate level courses should have graduate level prerequisites
- Need to decide on what the minimum grade should be for prereqs (B or C?); students can get a prerequisite waiver if they do not have the minimum grade
Accounting

ACC 5000 - Accounting Foundations I
Restrictions: Permission of department required; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ACC 5050 - Accounting Foundations II
Restrictions: Permission of department required; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ACC 5100 - Advanced Auditing and Fraud Examination
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): ACC 4100

ACC 5200 - Financial Statement Analysis
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ACC 5300 - Financial Reporting and Control
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ACC 5050

ACC 5500 - Strategic Cost Accounting
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ACC 5300

ACC 5600 - Taxation for Decision Makers
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ACC 5800 - Advanced Accounting Systems
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): ACC 4800

ACC 5900 - Current Issues in Accounting
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Atmospheric Science

ATM 5010 - Research Methods in Atmospheric Science

ATM 5100 - Atmospheric Sciences Research Discussion
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ATM 5515(C) or ATM 5640(C) or ATM 5680(C) or CE 5515 or PH 5640 or PH 5680

ATM 5200 - Special Topics in Atmospheric Sciences
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ATM 5512 - Applied Boundary Layer Meteorology
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CH 3510 or CH 3520 or ENVE 4504

ATM 5515 - Atmospheric Chemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CH 3510 or CH 3520 or ENVE 4504

ATM 5516 - Aerosol and Cloud Chemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): ATM 5515(C)

ATM 5519 - Atmospheric Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): CH 1150

ATM 5640 - Atmospheric Physics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 3530 and PH 2300

ATM 5680 - Atmospheric Fluid Dynamics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): MA 3530 and PH 2300

ATM 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ATM 6999 - Doctoral Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Biomedical Engineering

BE 5000 - Biomedical Masters Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5115 - Finite Element Modeling
Restrictions: Must be enrolled in one of the following Level(s): Graduate
BE 5200 - Cellular and Molecular Biology II
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5220 - Stem Cell Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5250 - Biomedical Optics

BE 5300 - Polymeric Biomaterials
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5310 - Biometric Materials
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5335 - Smart Polymers
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5510 - Cardiovascular Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5550 - Biostatistics for Health Science Research
Pre-Requisite(s): MA 2720 or MA 3710

BE 5610 - Biological Microscopy for Engineers
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5700 - Biosensors
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5755 - Medical Devices
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5770 - Biomedical Microcontrollers
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5800 - Advanced Biomaterials Interfaces
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5900 - Biomedical Engineering Masters Topics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5940 - Introduction to Tissue Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

BE 5990 - Biomedical Engineering Graduate Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 6000 - Doctoral Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 6900 - Biomedical Engineering Doctoral Topics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BE 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate


**Biological Sciences**

BL 5025 - The Scientific Profession
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

BL 5030 - Molecular Biology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5034 - Community Ecology and Evolutionary Dynamics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): BL 3400 and BL 3190

BL 5035 - Biomaging
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

BL 5036 - Ecology and Evolution of Interactions Between Plants and Insects
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): BL 3400 and BL 3190

BL 5042 - Scanning Electron Microscopy of Biological Specimens
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Co-Requisite(s): BL 5035

BL 5052 - Fluorescence and Video Microscopy of Biological Sciences
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): BL 5035

BL 5062 - Transmission Electron Microscopy of Biological Specimens
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): BL 5035

BL 5120 - Environmental Remediation and Toxicology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore
Pre-Requisite(s): BL 1020 or BL 1040

BL 5145 - Plant-Microbe Interactions
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

BL 5200 - Microbial Physiology
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): BL 3210 or BL 3310

BL 5340 - Special Topics in Biology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5350 - Special Topics in Physiology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5360 - Special Topics in Biochemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5370 - Special Topics in Microbiology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5380 - Special Topics in Ecology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5390 - Special Topics in Clinical Laboratory Science
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5400 - Special Topics in Plant Sciences
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5421 - Lake Superior Exploration
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5442 - Lake Ecology and Fish Biology

BL 5447 - Stream Ecology & Fish Biology

BL 5451 - Advanced Aquatic Ecology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5455 - Graduate Research Methods in Aquatic Ecology
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Co-Requisite(s): BL 4450

BL 5461 - Ecosystem Ecology
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): BL 3400 and CH 1122 or (CH 1160 and CH 1161)

BL 5500 - Graduate Seminar in Biological Sciences
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5501 - Graduate Research Seminar Ecology/Environmental
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

BL 5503 - Graduate Research Seminar Biomolecular
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

BL 5678 - Biological Sciences Field Service
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
Must be enrolled in one of the following Major(s): Biological Sciences

BL 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

BL 5990 - Masters Research in Biological Sciences
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BL 5991 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

BL 5994 - International Biological Sciences Practicum
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
Must be enrolled in one of the following Major(s): Biological Sciences

BL 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Biochemistry & Molecular Biology

BMB 6010 - Advanced Biochemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BMB 6020 - Advanced Molecular Biology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BMB 6030 - Modern BMB Laboratory
Restrictions: Must be enrolled in one of the following Level(s): Graduate

BMB 6075 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

BMB 6990 - Doctoral Research in Biochemistry and Molecular Biology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Civil Engineering

CE 5050 - Green Building Design
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 5101 - Bituminous Materials
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CE 3101

CE 5102 - Advanced Concrete Materials
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CE 3101

CE 5190 - Special Topics in Civil Engineering Materials

CE 5201 - Advanced Structural Analysis
Pre-Requisite(s): CE 4201

CE 5202 - Finite Element Analysis
Pre-Requisite(s): CE 4201

CE 5212 - Prestressed Concrete Design
Pre-Requisite(s): CE 4213

CE 5213 - Concrete and Masonry Building Systems
Pre-Requisite(s): CE 4213

CE 5223 - Steel Design II
Pre-Requisite(s): CE 4223

CE 5233 - Advanced Structural Timber Design
Pre-Requisite(s): CE 4233

CE 5241 - Structural Dynamics
Pre-Requisite(s): CE 4201(C)

CE 5242 - Advanced Structural Dynamics
Pre-Requisite(s): CE 5241

CE 5250 - Special Topics in Structural Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CE 5261 - Bridge Design and Construction
Pre-Requisite(s): CE 4213 and CE 4223

CE 5322 - Productivity Planning and Improvement
Pre-Requisite(s): CE 3332 or (BA 3810 and BA 3700)

CE 5337 - Project Delivery Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Class(es): Graduate

CE 5390 - Special Topics in Construction Engineering

CE 5401 - Advanced Pavement Design
Pre-Requisite(s): CE 4401

CE 5402 - Highway Design
Pre-Requisite(s): CE 3401

CE 5403 - Pavement Management Systems

CE 5404 - Transportation Planning

CE 5408 - Public Transit
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 5409 - Railroad Track Engineering and Design

CE 5411 - Intelligent Transportation Systems (ITS)
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 5422 - Sustainable Transportation Engineering
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

CE 5420 - Special Topics in Transportation Engineering
Restrictions: Permission of instructor required

CE 5620 - Stochastic Hydrology
Pre-Requisite(s): CE 3620 and MA 3710

CE 5630 - Advanced Hydrology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): CE 3620 or CE 3650

CE 5640 - Stormwater Management and LID
Pre-Requisite(s): CE 3620

CE 5665 - Stream Restoration
Pre-Requisite(s): CE 3620

CE 5666 - Water Resources Planning and Management
Pre-Requisite(s): CE 3620 and (EC 3400 or EC 3402 or ENT 3402)

CE 5690 - Special Topics in Water Resources

CE 5710 - Modeling and Simulation Applications for Decision-Making in Complex Dynamic Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CE 5720 - Descriptive Modeling of Data using Statistical and Graphical Methods
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CE 5730 - Probabilistic Analysis and Reliability
Pre-Requisite(s): CE 3710 or MA 3710

CE 5740 - Introduction to System Identification
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 3520 or MA 3521 or MA 3530

CE 5800 - Mathematical Modeling of Earth Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CE 5810 - Advanced Soil Mechanics
Pre-Requisite(s): CE 3810

CE 5820 - Geotechnical Engineering Laboratory
Pre-Requisite(s): CE 3810

CE 5850 - Stability of Earth Structures
Pre-Requisite(s): CE 3810

CE 5860 - Fundamentals of Soil Behavior
Pre-Requisite(s): CE 3810

CE 5890 - Special Topics in Geotechnical Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CE 5920 - Civil Engineering Independent Study
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CE 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

CE 5990 - Civil Engineering Graduate Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CE 5993 - Engineering with Developing Communities
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CE 5994 - International Civil & Environmental Engineering Field Experience
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CE 5997 - Natural Resources Engineering Field Service
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
Chemistry

CH 5110 - Pharmaceutical Chemistry: Drug Action
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 5120 - Pharmaceutical Chemistry: Drug Design
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 5210 - Analytical Separations
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CH 5230 - Mass Spectrometry and Fluorescence
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CH 5240 - Advanced Mass Spectrometry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requirement(s): CH 4212 or CH 4222

CH 5241 - Advanced Mass Spectrometry Laboratory
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requirement(s): CH 4212 or CH 4222

CH 5310 - Advanced Inorganic Chemistry
Pre-Requirement(s): CH 4320

CH 5410 - Advanced Organic Chemistry: Reaction Mechanisms
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 5420 - Advanced Organic Chemistry: Synthesis
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 5509 - Transport and Transformation of Organic Pollutants
Pre-Requirement(s): ENVE 4501 or CH 3510

CH 5510 - Classical and Statistical Thermodynamics
Pre-Requirement(s): CH 3520

CH 5515 - Atmospheric Chemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requirement(s): CH 3510 or ENVE 4501 or ENVE 4504

CH 5516 - Aerosol and Cloud Chemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requirement(s): ATM 5515(C)

CH 5517 - Soil Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CH 5519 - Atmospheric Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CH 5520 - Chemical Kinetics
Pre-Requirement(s): CH 3520

CH 5530 - Molecular Spectroscopy
Pre-Requirement(s): CH 3520

CH 5540 - Applications of Group Theory in Chemistry
Pre-Requirement(s): CH 3520

CH 5550 - Solid State Chemistry
Pre-Requirement(s): CH 3520

CH 5560 - Computational Chemistry
Pre-Requirement(s): CH 3520

CH 5570 - Advanced Biophysical Chemistry
Pre-Requirement(s): CH 3520

CH 5575 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

CH 5590 - Chemistry Master Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 6290 - Special Topics in Analytical Chemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 6390 - Special Topics in Inorganic Chemistry
Pre-Requirement(s): CH 4320

CH 6490 - Special Topics in Organic Chemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 6590 - Special Topics in Physical Chemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 6690 - Special Topics in Polymer Science
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CH 6790 - Special Topics in Biochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

CH 6800 - Current Topics in Graduate Chemistry
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CH 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

CH 6990 - Chemistry Doctoral Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Chemical Engineering

CM 5100 - Appl Mathematics for CM
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CM 5200 - Advanced CM Thermodynamics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CM 5300 - Advanced Transport Phenomena
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requirement(s): CM 5100

CM 5310 - Laboratory Safety

CM 5400 - Adv Reactive Systems Analysis
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CM 5500 - Theory and Methods of Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CM 5720 - Advanced Mineral Processing
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CM 5721 - Literature Reviews in Chemical Engineering
Restrictions: Permission of instructor required

CM 5760 - Vehicle Battery Cells and Systems
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requirement(s): MEEM 2200 or CM 3230 or MY 3100 or EE 2110 or MEEM 5990

CM 5770 - Advanced Analytical Microdevice Technologies
Restrictions: Permission of instructor required

CM 5780 - Advanced Biomaneufacturing and Biosafety
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CM 5900 - Special Topics in CM
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CM 5950 - Advanced Special Projects
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
Computer Science

CS 5090 - Special Topics in Computer Science
Restrictions: Permission of department required

CS 5091 - Graduate Seminar in Computer Science
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

CS 5130 - Compiler Design, Theory, and Optimization
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 4121

CS 5311 - Theory of Computation
Pre-Requisite(s): CS 3311

CS 5321 - Advanced Algorithms
Pre-Requisite(s): CS 4321

CS 5331 - Parallel Algorithms
Pre-Requisite(s): CS 4431 and CS 4331

CS 5411 - Advanced Operating Systems
Pre-Requisite(s): CS 4411

CS 5431 - Advanced Computer Architecture
Pre-Requisite(s): CS 4431

CS 5441 - Distributed Systems
Pre-Requisite(s): CS 4411

CS 5461 - Mobile Networks
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): CS 4461 or EE 4272

CS 5471 - Advanced Topics in Computer Security
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 4461 and CS 4471

CS 5481 - Systems Performance Analysis
Pre-Requisite(s): CS 4411 and MA 2720

CS 5491 - Cloud Computing
Pre-Requisite(s): CS 3425

CS 5495 - Software/Hardware Design of Multimedia Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 3411 and CS 3421

CS 5496 - GPU and Multicore Programming
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 3411 and CS 3421

CS 5611 - Computer Graphics: Advanced Rendering and Modeling
Pre-Requisite(s): CS 4611

CS 5631 - Data Visualization
Pre-Requisite(s): CS 4611 or CS 5611

CS 5641 - Immersive Virtual Environments
Pre-Requisite(s): CS 4611(C)

CS 5760 - Human-Computer Interactions and Usability Testing
Pre-Requisite(s): CS 4760

CS 5811 - Advanced Artificial Intelligence
Pre-Requisite(s): CS 4811

CS 5821 - Computational Intelligence - Theory and Application
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CS 5841 - Machine Learning
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): CS 4821

Computational Science & Engineering

CSE 5091 - Computational Science and Engineering Seminar
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CSE 5311 - Theory of Computation
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 3311

CSE 5321 - Advanced Algorithms
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 4321

CSE 5331 - Parallel Algorithms
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 4321 and CS 4431

CSE 5710 - Modeling and Simulation Applications for Decision-Making in Complex Dynamic Domains
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CSE 5720 - Descriptive Modeling of Data using Statistical and Graphical Methods
Restrictions: Must be enrolled in one of the following Level(s): Graduate

CSE 5811 - Advanced Artificial Intelligence
Pre-Requisite(s): CS 4811

CSE 6090 - Special Topics in Computational Science and Engineering
Restrictions: Permission of department required

CSE 6091 - Computational Science and Engineering Seminar
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

CSE 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

CSE 6990 - Doctoral Reading and Research
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

Economics
ED 5000 - Microeconomics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EC 3002

EC 5010 - Macroeconomics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EC 3003

EC 5300 - Managerial Economics
Restrictions: Must be enrolled in one of the following Level(s): Graduate;
Must be enrolled in one of the following Major(s): Applied Natural Resource Econ., Business Administration

EC 5400 - Advanced Engineering Economics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): BA 3400 or EC 3400

EC 5620 - Energy Economics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

EC 5630 - Mineral Industry Economics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

EC 5640 - Natural Resource Economics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EC 2001 or EC 3002

EC 5650 - Environmental Economics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EC 2001 or EC 3002

EC 5900 - Special Topics
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

EC 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

EC 5994 - Field Work in Applied Natural Resource Economics
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

EC 5999 - Graduate Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Education

ED 5100 - College Teaching
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ED 5110 - Educational Psychology
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ED 5210 - Principles of Education
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Co-Requisite(s): ED 5110, ED 5410

ED 5410 - Educational Field Experience
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Co-Requisite(s): ED 5110, ED 5210

ED 5420 - Mentoring Student Teachers
Restrictions: Permission of department required

ED 5540 - Special Studies in Education I
Restrictions: Permission of instructor required

ED 5550 - Special Studies in Education II
Restrictions: Permission of instructor required

ED 5560 - Ecology of Isle Royale for Educators
Restrictions: Permission of department required

ED 5561 - Aquatic Ecology of Isle Royale for Educators
Restrictions: Permission of department required

ED 5562 - Isle Royale Special Studies for Educators
Restrictions: Permission of department required

ED 5570 - Lesson Study
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ED 5580 - Fundamentals of Science Instruction
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ED 5581 - Teaching and Communicating Scientific Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ED 5590 - Developing Science, Technology, Engineering and Mathematics (STEM) Instruction
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ED 5600 - Independent Study in Education
Restrictions: Permission of instructor required

ED 5601 - Special Content Studies in Education

ED 5602 - Special Applications in Education

ED 5620 - Professional Development for Educators: Teaching Earth Science
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5621 - How the Earth Works
Restrictions: Permission of department required

ED 5622 - Earth Systems Science Pedagogy
Restrictions: Permission of department required

ED 5630 - Professional Development for Educators: Teaching Life Sciences
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5640 - Professional Development for Educators: Teaching Environmental Science
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5641 - Global Change Institute for Teachers

ED 5650 - Professional Development for Educators: Teaching Physical Science
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5660 - Professional Development for Educators: Teaching Mathematics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5661 - Professional Development for Educators: Teaching Mathematics through Navigation
Restrictions: Permission of department required; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5665 - Professional Development for Educators: Teaching Computer Science

ED 5670 - Professional Development for Educators: Teaching Technology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5680 - Professional Development for Educators: Teaching Social Studies
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5685 - Teaching World History and Geography
Restrictions: Permission of department required

ED 5686 - Regional Content for World History and Geography Education
Restrictions: Permission of department required

ED 5690 - Professional Development for Educators: Teaching Language Arts
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ED 5700 - Introduction to Education Research
Restrictions: Permission of instructor and department required

ED 5703 - Action Research in Depth
Restrictions: Permission of instructor and department required

ED 5705 - Action Research Project
Restrictions: Permission of instructor and department required

ED 5730 - STEM Learning Materials, Inquiry and Assessment
Restrictions: Permission of instructor and department required

ED 5740 - Designing Education Research
Restrictions: Permission of instructor and department required
Pre-Requisite(s): ED 5700
ED 5750 - Diagnosis and Remediation of Reading Problems
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ED 5800 - Applied Internship for Educators
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Co-Requisite(s): ENG 5100

ED 5820 - Advance Methods of Teaching Science
Restrictions: Permission of instructor and department required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ED 4700(C)

ED 5850 - Science Teacher Leaders Intern
Restrictions: Permission of department required

ED 5900 - Graduate Research in Education
Restrictions: Permission of department required

ED 5910 - Teaching Internship
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Co-Requisite(s): ED 5810
Pre-Requisite(s): ED 5110 and ED 5210 and ED 5410

ED 5920 - Teaching Internship - Preparation for International Teaching
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ED 4720 or ED 5820

ED 5921 - International Teaching Internship
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ED 4720 or ED 5820

ED 5975 - Full Time Master's Research
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

EE 5200 - Advanced Methods in Power Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EE 4222

EE 5220 - Transient Analysis Methods
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EE 4222

EE 5221 - Advanced Electric Machinery and Drives
Restrictions: Must be enrolled in one of the following Level(s): Graduate

EE 5223 - Power System Protection
Pre-Requisite(s): EE 5223(C)

EE 5227 - Advanced Power Electronics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 3120

EE 5228 - Advanced Power Electronics Lab
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 5227(C)

EE 5230 - Power System Operations
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5240 - Computer Modeling of Power Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering
Pre-Requisite(s): EE 5200

EE 5250 - Distribution Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 4221

EE 5260 - Wind Power
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EE 5290 - Selected Topics in Power Systems 1
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5295 - Advanced Propulsion Systems for Hybrid Electric Drive Vehicles
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering
Pre-Requisite(s): MEEM 4295 or EE 4295

EE 5296 - Advanced Propulsion Systems for Hybrid Electric Drive Vehicles Laboratory
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering
Pre-Requisite(s): MEEM 4296 or EE 4296

EE 5410 - Engineering Electromagnetics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

EE 5440 - Solid State Devices
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EE 5461 - Mobile Networks
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EE 4272 or CS 4461

EE 5470 - Semiconductor Fabrication
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EE 5471 - Microfabrication Laboratory
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

EE 5480 - Advanced MEMS
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EE 4240 or MY 4240

EE 5490 - Solar Photovoltaic Science and Engineering
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

EE 5495 - Software/Hardware Design of Multimedia Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 3411 and EE 4173

EE 5496 - GPU and Multicore Programming
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 3411 and EE 4173

EE 5500 - Probability and Stochastic Processes
Restrictions: Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EE 5511 - Information Theory
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 5500

EE 5521 - Detection & Estimation Theory
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Computer Engineering
Pre-Requisite(s): EE 5500

EE 5522 - Digital Image Processing
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Computer Engineering
Pre-Requisite(s): EE 3190 and EE 3160

EE 5523 - Radar Systems I
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EE 3140 or EE 3160

EE 5524 - Radar Systems II
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 5500 and EE 5521(C) and EE 5523
EE 5525 - Wireless Communications  
Restrictions: Must be enrolled in one of the following Level(s): Graduate

EE 5526 - Microwave Engineering  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 3140 or EE 5140

EE 5527 - Digital Communications  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 3250

EE 5528 - Antenna Engineering  
Pre-Requisite(s): EE 5526

EE 5535 - Wireless Communications II - Advanced Topics  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 3250 and EE 5527

EE 5715 - Linear Systems Theory and Design  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 3261 or MEEM 4700

EE 5726 - Embedded Sensor Networks  
Pre-Requisite(s): (CS 4461 or EE 4272 or EE 5722) and (EE 3170 or EE 3173) and (CS 1129 or CS 2141)

EE 5737 - VLSI Interconnections  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EE 5750 - Distributed Embedded Control Systems  
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering
Pre-Requisite(s): MEEM 4700 or EE 4261
Pre-Requisite(s): (MA 3710 or EE 3180) and (EE 4173 or CS 4431)

EE 5777 - Advanced Open-Source 3-D Printing  
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering

EE 5780 - Advanced VLSI Computer-Aided Design  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 4321 and EE 4271

EE 5805 - Directed Study in Electrical & Computer Engineering  
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5821 - Computational Intelligence - Theory and application  
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

EE 5841 - Machine Learning  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): CS 4090

EE 5900 - Special Topics in Electrical Engineering  
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Computer Engineering

EE 5975 - Full Time Master's Research  
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

EE 5990 - Thesis Research in Electrical Engineering  
Restrictions: Permission of instructor required

EE 5991 - Project Research in Electrical Engineering  
Restrictions: Permission of instructor required

EE 5992 - Practical Experience in Electrical Engineering  
Restrictions: Permission of department required

EE 5994 - International Electrical and Computer Engineering Field Experience  
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Computer Engineering

EE 6210 - Power System Dynamics and Stability  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 5200

EE 6702 - Nonlinear System Analysis and Control  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): EE 5715 or MEEM 5715

EE 6975 - Full-Time Doctoral Research  
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

EE 6990 - Doctoral Research  
Restrictions: Permission of instructor required

---

**Electrical Engineering Technology**

EET 5100 - Test Engineering Fundamentals  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EET 5120 - Electronic Manufacturing  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EET 3281

EET 5171 - Quality Control  
Restrictions: Permission of instructor required; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EET 5221 - EMC Test Engineering Fundamentals  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EET 5100

EET 5241 - Digital Hardware Testing  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): EET 5100

EET 5261 - Optical System Design and Testing  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

---

**Kinesiology and Integrative Physiology**

EH 5310 - Advanced Exercise Physiology  
Pre-Requisite(s): EH 4210 and EH 4211

EH 5320 - Advanced Biomechanics  
Pre-Requisite(s): EH 4500

EH 5330 - Advanced Motor Behavior  
Pre-Requisite(s): EH 4400 or EH 4420

Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

EH 5500 - Advanced Sport Psychology  
Pre-Requisite(s): EH 5310 or EH 5320 or EH 5330

EH 5510 - Advanced Strength and Conditioning  
Pre-Requisite(s): EH 5310 or EH 5320 or EH 5330

EH 5711 - Bioethics  
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EH 5900 - Laboratory Techniques in Integrative Physiology  
Restrictions: Permission of department required
Pre-Requisite(s): EH 5310 or EH 5320 or EH 5330

EH 5920 - Graduate Seminar  
Restrictions: Permission of department required
Pre-Requisite(s): EH 5310 or EH 5320 or EH 5330

EH 5950 - Graduate Internship in Kinesiology  
Restrictions: Permission of department required

EH 5990 - Master's Thesis in Kinesiology  
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

---

**Engineering Fundamentals**

ENG 5100 - The Engineering Process  
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ENG 5200 - Engineering Applications in the Physical Sciences  
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENG 5100 or (ENG 5101 and ENG 5102)
ENVE 5300 - Engineering Applications in the Earth Sciences
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENGE 5100

ENGE 5400 - Engineering Applications in the Life Sciences
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENGE 5100

ENVE 5510 - Sustainable Futures I
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore
Pre-Requisite(s): UN 2002

ENVE 5520 - Sustainable Futures II

ENVE 5540 - Sustainable Forest-Based Biofuel Pathways
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ENVE 5590 - Special Topics in Engineering
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

ENVE 5988 - Engineering Design Practicum
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering

Enterprise

ENT 5950 - Graduate Enterprise Project Work I
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

ENT 5960 - Graduate Enterprise Project Work II
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

Environmental Engineering

ENVE 5453 - Discover. Design. Delight 1
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENVE 5453 or MEEM 5453

ENVE 5454 - Discover. Design. Delight 2
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENVE 5453 or MEEM 5453

ENVE 5501 - Environmental Process Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENVE 4502 or ENVE 4508

ENVE 5502 - Biological Treatment Processes
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENVE 4502 or ENVE 4508

ENVE 5503 - Physical-Chemical Treatment Processes
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENVE 5501

ENVE 5504 - Modeling and Management of Lakes and Rivers
Pre-Requisite(s): ENVE 4505 or BL 4450

ENVE 5508 - Global Biogeochemistry
Pre-Requisite(s): ENVE 4501

ENVE 5509 - Transport and Transformation of Organic Pollutants
Pre-Requisite(s): ENVE 4501 or CH 3510

ENVE 5510 - Practical Applications and Analytical Techniques for Environmental Measurements
Restrictions: Permission of instructor required

Restrictions: Must be enrolled in one of the following Level(s): Graduate

ENVE 5515 - Atmospheric Chemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): ENVE 4501 or ENVE 4504 or CH 3510

ENVE 5517 - Soil Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ENVE 5518 - Aquatic Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ENVE 5519 - Atmospheric Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

ENVE 5560 - Advanced Topics in Air Quality Engineering
Restrictions: Permission of instructor required

ENVE 5561 - Advanced Topics in Biological Processes
Restrictions: Permission of instructor required

ENVE 5562 - Advanced Topics in Physical-Chemical Processes
Restrictions: Permission of instructor required

ENVE 5563 - Advanced Topics in Surface Water Quality Engineering
Restrictions: Permission of instructor required

ENVE 5590 - Special Topics in Environmental Engineering

ENVE 5630 - Advanced Hydrology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): CE 3620 or CE 3650

ENVE 5800 - Mathematical Modeling of Earth Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ENVE 5930 - Environmental Engineering Independent Study
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ENVE 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ENVE 5992 - Environmental Engineering Graduate Seminar II
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ENVE 5999 - Master's Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

ENVE 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

ENVE 6999 - Doctoral Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Environmental Engineering, Engineering - Environmental, Civil Engineering

Forest Resources & Environmental Science

FW 5000 - Distinguished Ecologist Lecture Series
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5020 - Indentification & Biology of Forest Vegetation
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5040 - Ecological Processes of Forests

FW 5060 - Forest Soil Science

FW 5076 - Molecular Techniques in Ecology

FW 5082 - Gene Expression Data Analysis

FW 5084 - Data Analysis and Graphics Using R
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5086 - Forest Policy Analysis Seminar
Restrictions: Must be enrolled in one of the following Major(s): Forestry

FW 5088 - Forest Finance & Economics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5098 - Advanced Wood Processing

FW 5100 - Advanced Terrestrial Ecology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5111 - Advanced Natural Resource Policy
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5115 - Restoration Ecology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5130 - Forest Vegetation Dynamics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore
Pre-Requisite(s): BL 3400 or FW 3010 or FW 3012 or FW 3020

FW 5135 - Plant Community Ecology
Restrictions: Must be enrolled in one of the following Level(s): Graduate
FW 5140 - Stable Isotopes in Ecology and Environmental Science

FW 5180 - Conservation Ethics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5210 - Biometeorology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5221 - Advanced Wetlands and Global Peatlands
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5230 - Ecohdrology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5240 - Advanced Topics in Climate Change
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5311 - Natural Resource Policy for Professionals
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5340 - Population Genetics and Applied Forest Genetics

FW 5368 - Forest Ecolphysiology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5370 - Forest Ecolphysiology Methods
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5376 - Advanced Forest and Environmental Resource Management I
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5377 - Advanced Forest & Environmental Resource Management II
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5400 - Advanced Conservation Biology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5411 - Applied Regression Analysis
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5412 - Regression in R
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): FW 5411

FW 5510 - Special Topics in Natural Resources
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5517 - Soil Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5519 - Atmospheric Biogeochemistry
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): CH 1150

FW 5540 - Advanced Terrestrial Remote Sensing
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5550 - Geographic Information Science and Spatial Analysis
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): MA 2710 or MA 2720 or MA 3710

FW 5554 - GPS Field Techniques
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5555 - Advanced GIS Concepts and Analysis
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): FW 5550

FW 5556 - GIS Project Management
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): FW 5550

FW 5557 - Applied Spatial Statistics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): FW 5550 or FW 3540

FW 5560 - Digital Image Processing: A Remote Sensing Perspective
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): FW 5540

FW 5562 - Herpetology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5578 - Natural Resources Field Service
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
Must be enrolled in one of the following College(s): Sch of Forest Res & Envir Sci

FW 5700 - Graduate Field Forestry

FW 5701 - Graduate Field Applied Ecology

FW 5710 - Trees in Agricultural Systems
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5720 - International Forestry Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): FW 5730

FW 5730 - Field Work in International Forestry
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

FW 5740 - Overseas Research
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

FW 5760 - Graduate Tropical Forestry
Restrictions: Permission of instructor required; May not be enrolled in one of the following Class(es): Freshman, Sophomore

FW 5770 - Rural Community Development Planning and Analysis
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5800 - Master's Graduate Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5801 - Masters Seminar in GIS
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5810 - Research Methods in Natural Resources
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 5811 - Advanced Responsible Conduct of Research in Natural Resources
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

FW 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

FW 5999 - Forest Resources and Environmental Science Master's Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 6800 - Doctoral Graduate Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

FW 6980 - Graduate Teaching
Restrictions: Must be enrolled in one of the following Level(s): Graduate

FW 6999 - Forest Resources and Environmental Science Doctoral Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Geological & Mining Engineering & Sciences

GE 5001 - Intercultural Natural Hazards Communication in Latin America
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

GE 5010 - Research Methods in Atmospheric Science

GE 5020 - Earth Systems Science I
Restrictions: Must be enrolled in one of the following Level(s): Graduate
GE 5030 - Earth Systems Science II
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5100 - Advanced Geomorphology and Glacial Geology
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): GE 2000

GE 5130 - Geology of the National Parks: Field Experience
Restrictions: Permission of instructor required

GE 5150 - Advanced Natural Hazards
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5180 - Volcanology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5185 - Special Topics in Volcanology
Restrictions: Must be enrolled in one of the following Major(s): Geology, Geophysics, Geological Engineering; May not be enrolled in one of the following Class(es): Freshman, Sophomore

GE 5187 - Volcanological Field Seminar
Restrictions: Must be enrolled in one of the following Major(s): Geology, Geophysics, Geological Engineering; May not be enrolled in one of the following Class(es): Freshman, Sophomore

GE 5195 - Volcano Seismology
Pre-Requisite(s): (MA 1160 or MA 1161 or MA 1135) and GE 2000 and PH 2100

GE 5200 - Advanced Geochemistry
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5230 - Earth Systems Institute I
Restrictions: Permission of department required; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

GE 5240 - Earth Systems Institute II
Restrictions: Permission of department required; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

GE 5250 - Advanced Computational Geosciences
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5400 - Global Geophysics and Geotectonics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 3160 and PH 2200 and GE 2000

GE 5430 - Advanced Planetary Geology and Geophysics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore
Pre-Requisite(s): GE 2000 and PH 2200 and MA 2160

GE 5600 - Advanced Reflection Seismology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5670 - Aquatic Remote Sensing
Pre-Requisite(s): PH 1200 and (CH 1150 or GE 2000 or BL 1010 or BL 1040)

GE 5785 - Seismic Petrophysics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5800 - Mathematical Modeling of Earth Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5850 - Advanced Groundwater Engineering and Remediation
Restrictions: Must be enrolled in one of the following Class(es): Graduate

GE 5870 - Geostatistics & Data Analysis
Pre-Requisite(s): GE 3250

GE 5930 - Special Topics in Geological Engineering
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5940 - Special Topics in Geology
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5950 - Special Topics in Geophysics
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5960 - Special Topics in Mining Engineering
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5970 - Special Topics in Global Environment Change

GE 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

GE 5994 - International Geological Practicum
Restrictions: Permission of instructor required; Must be enrolled in one of the following Major(s): Geology, Geophysics, Geological Engineering

GE 5995 - Domestic Geological Practicum
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5998 - International Geology Master's Research
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5999 - Master's Graduate Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

GE 6999 - Doctoral Graduate Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Humanities

HU 5001 - Proseminar in Rhetoric and Technical Communication
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Rhetoric & Tech Communication

HU 5002 - Rhetoric, Composition and Literacy Studies
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Rhetoric & Tech Communication

HU 5003 - Technical Communication and Technology Studies
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Rhetoric & Tech Communication

HU 5004 - Communication in Cultural Contexts
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Rhetoric & Tech Communication

HU 5010 - Organizational Communication
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5011 - Technology, Culture and Communication
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5012 - Communication Theory
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5020 - Composition Theory
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5021 - Literacy Theory and Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5030 - Linguistic Analysis
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5050 - Theories of Interculturality
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5070 - History and Theory of Rhetoric I
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5090 - Writing Creative Nonfiction
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5091 - Writing for Publication
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5100 - Qualitative Humanistic Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5110 - Backgrounds of Critical Theory
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5112 - Critical Perspectives on Science and Technology
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5113 - Cultural Studies
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5114 - Introduction to Visual Representation
Restrictions: Must be enrolled in one of the following Level(s): Graduate
HU 5116 - Rhetorics of Difference/Alterity
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5117 - Theories of Language
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5119 - Fieldwork in International English Education
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 5120 - Fieldwork in International Health Education
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 5711 - Bioethics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

HU 5870 - New Media Theory
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5900 - Independent Study
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 5901 - Directed Reading
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 5902 - Internship
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 5931 - Oral, Written and Visual Communication Pedagogies
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5932 - Practicum in Teaching Technical Communication
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5933 - Practicum in Modern Language Pedagogy
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5934 - Practicum in Teaching Communications
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 5992 - Internship
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 6112 - Special Topics in New Media
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 6114 - Special Topics in Visual Representation
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 6115 - Special Topics in Technical Communication
Restrictions: Must be enrolled in one of the following Level(s): Graduate

HU 6900 - Independent Study
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 6901 - Directed Reading
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 6902 - Internship
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 6903 - Doctoral Comprehensive Examination Reading
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

HU 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

HU 6990 - Doctoral Research
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

Mathematical Sciences

MA 5201 - Combinatorial Algorithms
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MA 5221 - Graph Theory
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 5301 or MA 4209

MA 5222 - Design Theory
Pre-Requisite(s): MA 4209 and MA 5301

MA 5231 - Error-Correcting Codes
Pre-Requisite(s): MA 5301

MA 5280 - Topics in Applied Combinatorics
Restrictions: Permission of department required

MA 5301 - Algebra I
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 4310

MA 5302 - Algebra II
Pre-Requisite(s): MA 5301

MA 5320 - Commutative Algebra
Restrictions: Permission of instructor required
Pre-Requisite(s): MA 4310

MA 5360 - Number Theory
Restrictions: Permission of instructor required
Pre-Requisite(s): MA 4310

MA 5401 - Real Analysis
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MA 5510 - Ordinary Differential Equations I
Pre-Requisite(s): MA 4450 and MA 4330

MA 5524 - Functional Analysis
Pre-Requisite(s): (MA 4330 or MA 4610) and MA 4450

MA 5548 - Mathematical Continuum Mechanics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MA 5565 - Partial Differential Equations
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 4450 and MA 4330

MA 5580 - Topics in Applied Mathematics
MA 5901 - Teaching College Mathematics I
Restrictions: Must be enrolled in one of the following Major(s): Mathematical Sciences, Mathematics; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MA 5701 - Statistical Methods
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MA 5711 - Mathematical Statistics I
Pre-Requisite(s): MA 4450 and MA 4760 and MA 4770

MA 5712 - Mathematical Statistics II
Pre-Requisite(s): MA 5711

MA 5731 - Linear Models
Pre-Requisite(s): MA 4710 and MA 4720 and MA 4760 and MA 4330

MA 5741 - Multivariate Statistical Methods
Pre-Requisite(s): (MA 4710 or MA 4720) and MA 2320

MA 5750 - Statistical Genetics

MA 5761 - Computational Statistics
Pre-Requisite(s): MA 4770(C)

MA 5781 - Time Series Analysis and Forecasting
Pre-Requisite(s): MA 3710 and MA 3720

MA 5791 - Categorical Data Analysis

MA 5901 - Teaching College Mathematics I
Restrictions: Must be enrolled in one of the following Major(s): Mathematical Sciences, Mathematics; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MA 5903 - Introduction to Scientific Programming

MA 5975 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

MA 5980 - Special Topics in Mathematics

MA 5999 - Graduate Research in Mathematics
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

MA 6222 - Advanced Topics in Design Theory
Restrictions: Permission of department required
Pre-Requisite(s): MA 5222

MA 6231 - Advanced Topics in Coding Theory
Restrictions: Permission of department required
Pre-Requisite(s): MA 5231

MA 6280 - Advanced Topics in Combinatorics, Algebra, or Number Theory
Restrictions: Permission of department required

MA 6300 - Advanced Topics in Algebra
Restrictions: Permission of department required
Pre-Requisite(s): MA 5302

MA 6500 - Advanced Topics in Applied Mathematics
Restrictions: Permission of department required

MA 6600 - Advanced Topics in Computational Mathematics
Restrictions: Permission of department required

MA 6700 - Advanced Topics in Statistics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MA 6701 - Probability
Pre-Requisite(s): MA 3720 and MA 5401

MA 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

MA 6980 - Special Topics in Mathematics
Special topics in mathematics.
Credits: variable to 12.0; Repeatable to a Max of 48
Semesters Offered: Fall, Spring, Summer

Graduate Course Descriptions, 2014-15, Page 13 of 18
MEEM 5450 - Vehicle Dynamics
Restrictions: Must be enrolled in one of the following College(s): College of Engineering
Pre-Requisite(s): (MEEM 3502 and MEEM 3000) or (EE 3305 and MEEM 2700)

MEEM 5453 - Discover. Design. Delight 1
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MEEM 5454 - Discover. Design. Delight 2
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5453 or ENVE 5453

MEEM 5610 - Advanced Machining Processes
Restrictions: May not be enrolled in one of the following Class(es): Sophomore, Junior
Pre-Requisite(s): MEEM 2500

MEEM 5615 - Advanced Metal Forming
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): MEEM 3502 or MEEM 2150

MEEM 5625 - Precision Manuf and Metrology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): MEEM 3502 and MEEM 3700

MEEM 5640 - Micromanufacturing Processes
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 3502(C)

MEEM 5645 - Numerical Anal Manuf Proc
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 2500

MEEM 5650 - Advanced Quality Engineering
Semesters Offered: Fall, Spring
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 3710

MEEM 5655 - Introduction to Lean Manufacturing
Restrictions: Must be enrolled in one of the following College(s): College of Engineering, School of Business & Economics
Pre-Requisite(s): MEEM 2500

MEEM 5660 - Data Based Modeling & Control
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MEEM 5665 - Micro and Nano Fabrication for Energy Applications
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Sciences & Arts, School of Technology, College of Engineering
Pre-Requisite(s): MA 3710

MEEM 5670 - Experimental Design in Enng
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MEEM 5680 - Optimization I
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MEEM 5685 - Environmentally Responsible Design and Manufacturing
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): MEEM 5700 - Dynamic Measurement/Signal Analysis

MEEM 5700 - Dynamic Measurement/Signal Analysis
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering
Pre-Requisite(s): MEEM 2150 and MEEM 2700

MEEM 5701 - Intermediate Dynamics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): MEEM 2700

MEEM 5702 - Analytical Vibroacoustics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 3700

MEEM 5703 - Exp Methods Vibro-Acoustics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5700 and MEEM 5702

MEEM 5705 - Introduction to Robotics and Mechatronics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 4700

MEEM 5715 - Linear Systems Theory and Design
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 4700 or EE 4261 or EE 3261

MEEM 5720 - Advanced Space Mechanics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 2700

MEEM 5750 - Distributed Embedded Control Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering
Pre-Requisite(s): MEEM 4700 or EE 4261 or EE 3261

MEEM 5800 - Advanced Engineering Mathematics with Applications
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Mechanical Engineering, Mechanical Eng-Eng Mechanics, Engineering Mechanics

MEEM 5875 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

MEEM 5990 - Special Topics
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

MEEM 5994 - International Mechanical Engineering Field Experience
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Mechanical Engineering

MEEM 5999 - Graduate Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Mechanical Engineering, Mechanical Eng-Eng Mechanics, Engineering Mechanics

MEEM 6000 - Graduate Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MEEM 6010 - Engineering Research Communications
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Mechanical Engineering, Mechanical Eng-Eng Mechanics, Engineering Mechanics

MEEM 6019 - Advanced Continuum Mechanics
Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering
Pre-Requisite(s): MEEM 5110

MEEM 6120 - Dynamic Behavior of Materials
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 2150 and MEEM 2700

MEEM 6130 - Engineering Fracture Mechanics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5110

MEEM 6230 - Conduction
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5230

MEEM 6240 - Convective Heat Transfer
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5230

MEEM 6250 - Radiative Heat Transfer
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5230

MEEM 6701 - Advanced Acoustics
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5700 and MEEM 5702

MEEM 6702 - Nonlinear Sys Analy & Control
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 5715

MEEM 6703 - Advanced Vibrations
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MEEM 3700

MEEM 6705 - Advanced Dynamics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MEEM 6795 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

MEEM 6990 - Special Topics
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Materials Science & Engineering

MY 5100 - Thermodynamics and Kinetics I
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5102 - Advanced Concrete Materials
Pre-Requisite(s): CE 3101

MY 5110 - Thermodynamics and Kinetics II
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5190 - Advanced Materials Processing for Mechanical, Energy, and Biomedical Applications
Restrictions: Must be enrolled in one of the following College(s): College of Engineering; May not be enrolled in one of the following Class(es): Freshman, Sophomore

MY 5200 - Advanced Scanning Electron Microscopy
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5250 - Transmission Electron Microscopy
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5260 - Crystallography & Diffraction
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5400 - Mechanical Behavior of Materials
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5410 - Materials for Energy Applications
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MY 5430 - Electronic Materials
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5460 - Solid State Devices

MY 5470 - Semiconductor Fabrication
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MY 5480 - Advanced MEMS
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MY 5490 - Solar Photovoltaic Science and Engineering
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

MY 5550 - Solid Surfaces
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5580 - Introduction to Scanning Probe Microscopy
Restrictions: Must be enrolled in one of the following Level(s): Graduate

MY 5600 - Powder Processing
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MY 5610 - Materials Recycleing: Processing and Utilization
Restrictions: Must not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MY 5760 - Vehicle Battery Cells and Systems
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MY 5900 - Graduate Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate

Physics

PH 5010 - Graduate Journal Club
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5020 - Special Topics in Physics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5110 - Classical Mechanics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5210 - Electrodynamics I
Pre-Requisite(s): PH 5320

PH 5211 - Electrodynamics II
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5310 - Statistical Mechanics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5320 - Mathematical Physics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5410 - Quantum Mechanics I
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5411 - Quantum Mechanics II
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5510 - Theory of Solids
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5520 - Materials Physics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5530 - Selected Topics in Nanoscale Science and Technology
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

PH 5610 - High Energy Astrophysics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5640 - Atmospheric Physics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 5680 - Atmospheric Fluid Dynamics
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

PH 5750 - Special Topics - Graduate Materials Science and Engineering
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

PH 5757 - Full Time Master's Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PH 5990 - MS Thesis Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 6100 - Computational Materials Science and Engineering
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 6110 - Advanced Topics in Materials Processing
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 6200 - Advanced Topics in Materials Characterization
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 6400 - Advanced Topics in Mechanical Behavior of Materials
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PH 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PH 6990 - PhD Thesis Research
Restrictions: Must be enrolled in one of the following Level(s): Graduate
PH 5999 - Master's Research
Restrictions: Permission of instructor and department required; Must be enrolled in one of the following Level(s): Graduate

PH 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PH 6999 - Doctoral Research
Restrictions: Permission of instructor and department required; Must be enrolled in one of the following Level(s): Graduate

Psychology

PSY 5000 - Advanced Responsible Conduct of Research Training: Basic and Human Subjects
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PSY 5010 - Cognitive Psychology
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5060 - Cognitive Systems
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5095 - Practicum
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5100 - Applied Cognitive Science
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5160 - Sensation and Perception
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5210 - Advanced Statistical Analysis and Design I
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5220 - Advanced Statistical Analysis and Design II
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PSY 5110

PSY 5300 - Human Performance
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5390 - Testing and Measurement Advanced Psychometrics
Restrictions: Permission of department required
Pre-Requisite(s): PSY 5210

PSY 5400 - Ergonomics and Biomechanics
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5410 - Computational and Mathematical Models of Human Cognition and Behavior
Restrictions: Permission of department required

PSY 5500 - Supervised Teaching Practicum
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5510 - Memory and Learning: Review, Synthesis, and Applications
Restrictions: Permission of department required

PSY 5610 - Automation
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5620 - Displays and Alarms
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PSY 5160

PSY 5750 - Judgment and Decision Making
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5850 - Human Factors Psychology
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5860 - Human Factors II
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PSY 5850

PSY 5880 - Current Issues in Human Factors
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): PSY 5850

PSY 5900 - Graduate Research Project
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5910 - Independent Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 5999 - Graduate Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 6975 - Full-Time Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 6990 - Special Topics in Cognitive Science
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 6991 - Special Topics in Human Factors
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

PSY 6999 - Doctoral Research
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

Systems Administration Technology

SAT 5001 - Introduction to Medical Informatics
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5111 - Security and Privacy
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5121 - Introduction to Medical Sciences, Human Pathophysiology, Healthcare
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5131 - System Analysis and Design
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5141 - Clinical Decision Support and Improving Healthcare
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5151 - Application Integration and Interoperability
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5161 - Data Warehousing and Business intelligence
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5211 - Medical Application Development and Security
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5231 - Statistical Methods for Intrusion Detection
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5241 - Designing Security Systems
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): SAT 5111

SAT 5251 - Advanced Topics in Network Security
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5261 - Medical Image Analysis
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): CS 1111 or SAT 1200

SAT 5281 - Healthcare Security Management
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SAT 5975 - Full Time Master's Research
Restrictions: Permission of department required; May not be enrolled in one of the following Level(s): Graduate

SAT 5990 - Special Topics in Medical Informatics
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS 5001</td>
<td>Advanced Social Science Methods</td>
<td></td>
</tr>
<tr>
<td>SS 5003</td>
<td>Survey Methods</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5004</td>
<td>Statistics for the Social Sciences</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5005</td>
<td>Introduction to Computational Social Science</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5101</td>
<td>Directed Study</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5105</td>
<td>Cultural/Environmental Office of Surface Mining VISTA Field Service Internship</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5111</td>
<td>Advanced Natural Resource Policy</td>
<td></td>
</tr>
<tr>
<td>SS 5150</td>
<td>Natural Hazards and Human Impacts</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5201</td>
<td>Cultural Dimensions of International Immersion and Research</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5300</td>
<td>Environmental &amp; Energy Policy</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5301</td>
<td>The Policy Process</td>
<td></td>
</tr>
<tr>
<td>SS 5302</td>
<td>Environmental Governance and Decision Making - Nature, Culture, and Power</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5310</td>
<td>Ecological Economics</td>
<td></td>
</tr>
<tr>
<td>SS 5313</td>
<td>Sustainability Science, Policy, and Assessment</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5315</td>
<td>Population and Environment</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5318</td>
<td>Public Sector Management</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5320</td>
<td>Special Topics in Environmental Policy</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5330</td>
<td>Special Topics in Energy Policy</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5340</td>
<td>Principles of Interdisciplinary Team Science</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5350</td>
<td>Environmental Policy Analysis</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5400</td>
<td>Sociology of the Environment</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5410</td>
<td>Critical Cartography</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5500</td>
<td>IA Proseminar: History of Technology</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5501</td>
<td>IA Proseminar: Industrial Communities</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5502</td>
<td>IA Proseminar: Historical Archaeology</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5503</td>
<td>IA Proseminar: Material Culture Studies</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5530</td>
<td>Deindustrialization and Urban Environments</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5550</td>
<td>Global Environmental History</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5600</td>
<td>Industrial Archaeology</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5635</td>
<td>International Environmental Policy</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5700</td>
<td>Archaeological Field Methods</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5800</td>
<td>Documentation of Historic Structures</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5820</td>
<td>Advanced, Ethical, Legal and Societal Implications (ELS) of Nanotechnology</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5900</td>
<td>Heritage Management</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5905</td>
<td>Heritage Ecologies: Heritage, Culture, Environment</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 5975</td>
<td>Full Time Master's Research</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 6002</td>
<td>Research Design</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 6010</td>
<td>Special Topics in Industrial Heritage</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 6020</td>
<td>Special Topics in Industrial History</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 6100</td>
<td>Advanced Seminar in Energy and Climate Policy</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 6500</td>
<td>Directed Reading/Independent Study</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 6600</td>
<td>PhD. Dissertation Research</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SS 6975</td>
<td>Full-Time Doctoral Research</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
</tbody>
</table>

**Surveying**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SU 5001</td>
<td>Practicum in Unmanned Aerial Vehicle (UAV) Guidance Navigation and Control</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SU 5002</td>
<td>Infrared Technology, Sensors, and Applications</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SU 5003</td>
<td>Geographic Information Systems (GIS) Technology Fundamentals</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SU 5004</td>
<td>Introduction to Geospatial Image Processing</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SU 5010</td>
<td>Geospatial Concepts, Technologies, and Data</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SU 5020</td>
<td>Data Analysis and Adjustments</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
<tr>
<td>SU 5021</td>
<td>Geodetic Models</td>
<td>Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate</td>
</tr>
</tbody>
</table>

Graduate Course Descriptions, 2014-15, Page 17 of 18
SU 5022 - Positioning with GNSS
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): SU 5020

SU 5023 - Geospatial Positioning
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5041 - Geospatial Data Processing
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5042 - Digital Cartography
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5043 - Topographic Analysis
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5044 - Remote Sensing and Cartography
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5045 - Geospatial Data Fusion
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5050 - Data Mining for Geospatial Applications
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5301 - Acquiring Aerial Images Using Unmanned Aerial Systems for Geoscience Applications
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5480 - Geospatial Science and Technology to Support Land Cadastre
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5540 - Advanced Photogrammetry - Satellite Photogrammetry
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): SU 4140

Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): SU 4140

SU 5800 - Geospatial Master's Graduate Seminar
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5930 - Synthetic Aperture Radar (SAR) Fundamentals and Applications
Restrictions: Must be enrolled in one of the following Level(s): Graduate

SU 5990 - Special Topics in Geospatial Technology
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

SU 5998 - Graduate Practicum
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

SU 5999 - Master's Graduate Research
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

Technology

TE 5000 - Independent Study in Technology
Restrictions: Permission of instructor required; May not be enrolled in one of the following Class(es): Senior

TE 5001 - Special Topics in Technology
Restrictions: Permission of instructor required; May not be enrolled in one of the following Class(es): Senior

TE 5100 - Systems Design and Integration
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

TE 5200 - Systems Quality and Reliability
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

TE 5300 - Systems Project Management
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

University Wide
UN 0500 - Effective Scholarship
Restrictions: Must be enrolled in one of the following Level(s): Graduate

UN 5000 - Cooperative Education - Graduate
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

UN 5510 – Center for Water and Society Colloquium

UN 5500 - Research Integrity Workshop
Restrictions: Must be enrolled in one of the following Level(s): Graduate

UN 5540 - Pan American Biofuels and Bioenergy Sustainable Development
Restrictions: Must be enrolled in one of the following Level(s): Graduate

UN 5550 - Introduction to Data Science
Restrictions: Permission of instructor required

UN 5555 - Integrated International Studies
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

UN 5951 - Graduate Status - Maintenance of Continuous Enrollment
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

UN 5953 - Final-Term Graduate Registration
Restrictions: Permission of department required; Must be enrolled in one of the following Level(s): Graduate

UN 5990 - Special Topics - Interdisciplinary
Restrictions: Permission of instructor required
Graduate School Communications Assistance Program
Harriet King, Coordinator

http://www.mtu.edu/gradschool/gscal

gscal@mtu.edu
(906) 281-7122

The Graduate School Communications Assistance Program (GS-CAP) provides written and oral/aural communication support to graduate students, faculty, and staff. Services available include, but are not limited to, writing assistance, presentation preparation, and formatting assistance. GS-CAP is particularly suited to assist individuals on an intensive or time-sensitive basis.

New this semester – formatting workshops
Join Harriet King, coordinator of the Graduate School Communications Assistance Program for group work hours in the Library. These workshops are provided at no-charge to students working on a dissertation, thesis, or report. Harriet is skilled with MS Office, Open Office, and Adobe Acrobat Pro, and can provide group tutoring and assistance during these open times:

- Wednesday, December 3, 2014, 1-5pm – Library 242
- Friday, December 5, 2014, 1-5pm – Library 242
- Monday, December 8, 2014, 9am-1pm – Library 244
- Tuesday, December 9, 2014, 1-3pm – Library 244
- Wednesday, December 10, 2014, 9am-1pm – Library 244
- Thursday, December 11, 2014, 1-3pm – Library 244
- Monday, December 15, 2014, 10am – 1pm – Library 242
- Tuesday, December 16, 2014, 10am – 1pm – Library 242
- Wednesday, December 17, 2014, 10am – 1pm – Library 242

These rooms are equipped with PCs with University software, or you may bring your own laptop.

If you need additional help or prefer one-on-one assistance, please contact Harriet to arrange for times and inquire about the services available.

Individual Tutoring
A variety of support services can be provided through individual tutoring sessions. Some common areas of assistance include:

- Writing Assistance: receive collaborative support to revise, edit, and proof your documents. This includes class papers, journal articles, theses, and dissertations. Additional help will be provided for paraphrasing, summarizing, and citing sources.
- Public Speaking: receive feedback and improve your public speaking skills as you prepare for class, an oral exam, or conference presentations.
- Formatting assistance: receive training and assistance on formatting documents, especially theses and dissertations, using MS Office, Open Office, or Adobe Acrobat Pro.

Group Workshops
By arrangement, group workshops will be offered to enhance writing and oral/aural communication skills. If you would like to recommend or schedule a workshop to be offered you can send your recommendations to the Graduate School.

Cost of Services
Costs are billed at $30/hour on Banweb. Contact the Graduate School for a current list of available providers. Additional providers at negotiable rates may also be available.
Update on Graduate Program Review

The Graduate School has been working to take the guidelines for Graduate Program Review (approved by the GFC on October 21, 2010) and update them so that it is clear how they align with the University Learning Goals, University Strategic Plan, and guidance regarding assessment provided to the University by the Higher Learning Commission. This will be helpful for communication with our accreditation authority.

One thing that has become clear (and is not surprising) is that for PhD students, the Qualifying Exam, Proposal Defense, Final Oral Defense, and Dissertation are key elements in the assessment of PhD students.

PhD Student Goals:

1) Disciplinary knowledge (measured by the Qualifying Exam)
2) Ability to design a research project (Proposal Defense)
3) Ability to conduct research (Final Oral Exam and Dissertation)
4) Ability to communicate the results of research orally and in writing (Final Oral Exam and Dissertation)

In addition to these university-wide goals for PhD students there may also be program specific goals.

On the following page you will find some draft rubrics that could be used by faculty (and potentially others) to assess student learning outcomes at the Proposal Defense, Final Oral Defense, and Dissertation stages (prepared by Alex Guth).

We are interested in receiving feedback on these rubrics from the GFC.
Please evaluate the written document on the following criteria, using the attached rubric.

<table>
<thead>
<tr>
<th>Lumina</th>
<th>Beginning (1)</th>
<th>Developing (2)</th>
<th>Proficient (3)</th>
<th>Exemplary (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3e: Comm. fluency</strong></td>
<td>Control of Syntax and Mechanics: Quality of language use to communicate meaning and control over errors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3e: Comm. fluency</strong></td>
<td>Organization &amp; Conventions: Clear and consistent organizational pattern and structuring elements including introduction, thesis and main points, conclusion, and transitions; follows formal and informal rules of genre or disciplinary expectations about organization, content, presentation, formatting, and stylistic choices.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3b: Info Resources</strong></td>
<td>Sources and Evidence: Uses a variety of quality sources and acknowledges different views to support ideas appropriate for discipline and genre of writing (e.g., citation styles); may use data to support observations and draw conclusions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3a: Analytic Inquiry</strong></td>
<td>Proposes Solutions/Models/Hypotheses: Ability to propose and evaluate questions, solutions, models, and/or hypotheses related to a problem or a description of a natural phenomenon.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1: Specialized Knowledge</strong></td>
<td>Content Development: Uses appropriate and relevant content to develop ideas, situate ideas in a disciplinary context, and shape the work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2: Integrative Knowledge</strong></td>
<td>Thinking Innovatively: Creating and applying significant ideas</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
<table>
<thead>
<tr>
<th>Column 1</th>
<th>Beginning (1)</th>
<th>Developing (2)</th>
<th>Proficient (3)</th>
<th>Exemplary (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control of Syntax and Mechanics:</strong> Quality of language use to communicate meaning and control over errors</td>
<td>Shows some understanding of writing basics but errors distract from meaning.</td>
<td>Shows understanding of writing basics and conveys meaning although may have noticeable errors.</td>
<td>Shows competent use of writing to clearly convey meaning with few errors.</td>
<td>Shows skillful use of writing to communicate meaning with clarity, fluency, and virtually error-free.</td>
</tr>
<tr>
<td>Organization &amp; Conventions: Clear and consistent organizational pattern and structuring elements including introduction, thesis and main points, conclusion, and transitions; follows formal and informal rules of genre or disciplinary expectations about organization, content, presentation, formatting, and stylistic choices.</td>
<td>Develops unclear or inconsistent organizational pattern; shows little awareness of genre and disciplinary conventions.</td>
<td>Develops organizational pattern unevenly; follows disciplinary or task expectations at a basic level of understanding.</td>
<td>Develops recognizable organizational pattern that structures the whole work; uses disciplinary or task conventions consistently.</td>
<td>Develops organizational pattern that enhances flow and cohesiveness through the whole work; demonstrates detailed attention to and successful execution of disciplinary or task conventions.</td>
</tr>
<tr>
<td>Sources and Evidence: Uses a variety of quality sources and acknowledges different views to support ideas appropriate for discipline and genre of writing (e.g., citation styles); may use data to support observations and draw conclusions</td>
<td>Demonstrates minimal support for ideas in the writing.</td>
<td>Demonstrates an attempt to use credible and/or relevant sources.</td>
<td>Demonstrates consistent use of credible, relevant sources.</td>
<td>Demonstrates skillful use of high-quality, credible, diverse, and relevant sources.</td>
</tr>
<tr>
<td>Proposes Solutions/Models/Hypotheses: Ability to propose and evaluate questions, solutions, models, and/or hypotheses related to a problem or a description of a natural phenomenon.</td>
<td>Demonstrates a basic understanding of the problem or phenomenon, but is unable to provide even a superficial approach to solve the problem, or to understand or conceptualize the phenomenon within modern discipline—specific frameworks.</td>
<td>As appropriate to the given problem or phenomenon, is able to provide an appropriate solution, model, or hypothesis to solve the problem or understand or conceptualize the phenomenon within modern disciplinary frameworks. Carries out only superficial or workmanlike solutions, perhaps incorrectly. Is able to pose basic original questions about phenomena.</td>
<td>As appropriate to the given problem or phenomenon, is able to provide an appropriate solution, model, or hypothesis to solve the problem or understand or conceptualize the phenomenon within modern disciplinary frameworks. Carries out correct analysis to solve the problem or evaluate models and/or hypotheses, is able to pose insightful original questions about phenomena.</td>
<td>Proposes one or more solutions, models, or hypotheses indicating a deep understanding of the problem or phenomenon. Carries out correct, detailed solution or discipline—specific analysis to completion, with awareness of limiting factors based on approximations and/or assumptions. Poses insightful original questions about phenomena, and can articulate a reasoned approach for further investigation.</td>
</tr>
<tr>
<td>Content Development: Uses appropriate and relevant content to develop ideas, situate ideas in a disciplinary context, and shape the work</td>
<td>Demonstrates simplistic development of content in some parts of the work.</td>
<td>Demonstrates appropriate development of ideas and disciplinary context through most of the work.</td>
<td>Demonstrates compelling ideas and subject development through the whole work.</td>
<td>Demonstrates subject mastery.</td>
</tr>
<tr>
<td>Thinking Innovatively: Creating and applying significant ideas</td>
<td>Reformulates a collection of available ideas.</td>
<td>Experiments with generating a significant or unique idea, question, format, or product.</td>
<td>Creates a significant idea, question, format, or product.</td>
<td>Extends a significant idea, question, format, or product to create new knowledge or knowledge that crosses boundaries.</td>
</tr>
</tbody>
</table>
Oral Presentation Evaluation (for everyone in attendance at presentation)

Student Name: _________________________
Program: ______________________________
Defense date: __________________________
Student Level: (MS, PhD)

I am a…. (Faculty in program; faculty outside program; committee member; student)

Please evaluate the oral presentation on the following criteria, using the attached rubric.

<table>
<thead>
<tr>
<th>Lumina</th>
<th>Beginning (1)</th>
<th>Developing (2)</th>
<th>Proficient (3)</th>
<th>Exemplary (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delivery &amp; Composure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posture, gestures, eye contact, and vocal expressiveness; impression of composure and confidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Organizational Pattern</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear, consistent and recognizable structure (specific introduction and conclusion, sequenced material within the body, use of transitions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Visual Aids</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visible, attractive, and comprehensible visual display materials support major points or themes; appropriate to situation; design and handling add to effectiveness of presentation and speaker’s credibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3e: Comm. fluency</strong></td>
<td>Explanation of Issues: Clear and comprehensive communication of issues or problems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3d: Quant. fluency</strong></td>
<td>Interpretation: Ability to explain information that is presented in mathematical forms (e.g., equations, graphs, diagrams, tables)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3b: Info. Resources</strong></td>
<td>Evidence: Critical analysis or synthesis of information from a variety of sources</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
<table>
<thead>
<tr>
<th></th>
<th>Beginning (1)</th>
<th>Developing (2)</th>
<th>Proficient (3)</th>
<th>Exemplary (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delivery &amp; Composure:</strong> Posture, gestures, eye contact, and vocal expressiveness; impression of composure and confidence</td>
<td>Detract from the understandability of the presentation or speaker appears uncomfortable</td>
<td>Makes the presentation understandable or speaker appears tentative</td>
<td>Makes the presentation interesting and speaker appears composed</td>
<td>Makes the presentation compelling and speaker appears polished and confident</td>
</tr>
<tr>
<td><strong>Organizational Pattern:</strong> Clear, consistent and recognizable structure (specific introduction and conclusion, sequenced material within the body, use of transitions)</td>
<td>Is not recognizable</td>
<td>is intermittently recognizable</td>
<td>is clear and consistent</td>
<td>enhances the content</td>
</tr>
<tr>
<td><strong>Visual Aids:</strong> Visible, attractive, and comprehensible visual display materials support major points or themes; appropriate to situation; design and handling add to effectiveness of presentation and speaker's credibility</td>
<td>Do not support main points and/or detract from or overwhelm the presentation</td>
<td>Provide basic support for main points with minimal contribution to effectiveness of presentation</td>
<td>Enhance the effectiveness of the presentation</td>
<td>Increase the effectiveness of the presentation, add insight to main points, and augment speaker's credibility</td>
</tr>
<tr>
<td><strong>Explanation of Issues:</strong> Clear and comprehensive communication of issues or problems</td>
<td>Idea/Issue/problem to be considered is stated without clarification or description.</td>
<td>Idea/Issue/problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown.</td>
<td>Idea/Issue/problem to be considered critically is stated, described, and clarified so that understanding is communicated.</td>
<td>Idea/Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.</td>
</tr>
<tr>
<td><strong>Interpretation:</strong> Ability to explain information that is presented in mathematical forms (e.g., equations, graphs, diagrams, tables)</td>
<td>Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means.</td>
<td>Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related computations or units.</td>
<td>Provides accurate explanations of information presented in mathematical forms.</td>
<td>Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information.</td>
</tr>
<tr>
<td><strong>Evidence:</strong> Critical analysis or synthesis of information from a variety of sources</td>
<td>Information is taken from one or a few sources without any interpretation/evaluation. Viewpoints of experts are taken as fact, without question.</td>
<td>Information is taken from a variety of sources with some interpretation/evaluation, but not enough to develop an analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.</td>
<td>Information is taken from a variety of sources with enough interpretation or evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are possibly subject to questioning.</td>
<td>Information is taken from a variety of sources with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are subject to questioning.</td>
</tr>
</tbody>
</table>
The University Senate of Michigan Technological University

Proposal XX-15

(Voting Units: Academic)

“Definition of “Joint” Faculty Appointments”

I. Background

This proposal is to formalize the definition of a term applied to tenured or tenure-track faculty who contribute scholarship in more than one discipline at the University.

This proposal also rectifies the current situation regarding the use of the term “adjunct” at Michigan Tech. At Michigan Tech, the term “adjunct” is currently applied to faculty members who contribute scholarship in more than one discipline at the University but only receive financial compensation from one discipline. This use of the term “adjunct” is not in alignment with the usage of the term at other institutions of higher education.

II. Proposal

The proposed changes are intended to be added to the Tenured/Tenure-Track Faculty Handbook.

II.a. Joint Faculty Appointments

JOINT FACULTY APPOINTMENT (Professor, Associate Professor, Assistant Professor):
Joint faculty appointments are used to acknowledge and support the scholarly contributions that faculty may make in more than one discipline.

All faculty members holding joint appointments must have a primary affiliation within an academic department or school. The primary department or school will be responsible for annual reviews for the faculty member’s reappointment, tenure, promotion, and salary consideration. The primary department/school will seek and consider written input from the chair of the department(s) and/or dean of the school(s) hosting the faculty member’s joint appointments.

Joint faculty appointments may or may not be associated with the distribution of salary for a faculty member among two (or potentially more) academic units at Michigan Tech.

Joint faculty appointments are at the same rank (i.e., professor, associate professor, or assistant professor) as a faculty member’s primary appointment.
Joint faculty appointments are possible with non-departmental and interdisciplinary programs as well as with departments or departmental programs.

All requests for joint appointments must be approved by the provost. Requests for joint appointments also need approval from the:

- faculty member’s primary academic department chair or school dean,
- dean of the faculty member’s primary college (if in a college)
- faculty member’s joint-appointment discipline’s department or school (for disciplinary appointments) or the appropriate executive group or director and Graduate Dean for interdisciplinary appointments.
- dean of the faculty member’s joint appointment college (if the joint-appointment discipline is housed in a college)
The University Senate of Michigan Technological University

Proposal XX-15

(Voting Units: Academic)

“Modify the Definition of the Term “Adjunct” Faculty”

I. Background

This proposal is to modify the definition of adjunct faculty to bring the usage of this term as it is applied at Michigan Tech into line with how the term “adjunct” is used at other institutions of higher education.

II. Proposal

The proposed changes to the Tenured/Tenure-Track Faculty Handbook are as shown in the remainder of this document.

II.a. Adjunct Faculty

Current Definition of Adjunct Faculty (from Section 1.5.5, Non-Tenure-Track Academic Rank Definitions, Tenured/Tenure-Track Faculty Handbook; http://www.admin.mtu.edu/admin/prov/facbook/ch1/1chap-19.htm)

ADJUNCT (Assistant Professor/Associate Professor/Professor): An appointment at this rank is offered to persons not regularly or primarily employed within the academic unit to which the appointment is made. Such individuals--because of training, experience, credentials, and interest--are invited to participate in the teaching, research, and/or instructional programs of academic departments. Ordinarily no remuneration is associated with adjunct appointments, but on the approval of the President, remuneration may be provided for teaching and/or research activities. Appointments shall be for no more than three years with the possibility of subsequent appointments.

Proposed New Definition of Adjunct Faculty (shown with changes from the original tracked)

ADJUNCT (Professor, Associate Professor, Assistant Professor): An appointment at this rank is offered to persons not regularly or primarily employed within the academic unit to which the appointment is made at the University. Such individuals--because of training, experience, credentials, and interest--are invited to participate in the teaching, research, and/or instructional programs of
Ordinarily no remuneration is associated with adjunct appointments, but on the approval of the President, Remuneration may be provided for teaching and/or research activities. Appointments shall be for no more than three years with the possibility of subsequent reappointments.

Proposed **New Definition of Adjunct Faculty** (shown with all changes from the original accepted)

**ADJUNCT (Professor, Associate Professor, Assistant Professor):** An appointment at this rank is offered to persons not regularly or primarily employed within an academic unit at the University. Such individuals--because of training, experience, credentials, and interest--are invited to participate in the teaching, research, and/or instructional programs of academic departments. Remuneration may be provided for teaching and/or research activities. Appointments shall be for no more than three years with the possibility of subsequent reappointments.